

CONTINUATION IN PART

Application Based on

Docket **83072ASLP**

Inventors: William C. Wendlandt and Daniel N. Peek

Customer No. 01333

STORAGE PHOSPHOR CASSETTE

Commissioner for Patents,
ATTN: BOX PATENT APPLICATION
Washington, D. C. 20231

Express Mail Label No.: **EL486846697US**

Date: August 6, 2001

STORAGE PHOSPHOR CASSETTE

CROSS REFERENCE TO RELATED APPLICATION

This is a continuation-in-part of application Serial No. 09/896,697,
5 filed June 29, 2001 entitled " STORAGE PHOSPHOR CASSETTE " by
Wendlandt et al.

Reference is made to commonly assigned application U.S. Serial
No. 09/896,735, entitled "A STORAGE PHOSPHOR CASSETTE HAVING A
CORNER ELEMENT", and filed on common date herewith in the names of
10 Wendlandt et al., and which is assigned to the assignee of this application.

Reference is made to commonly assigned application U.S. Serial
No. 09/896,625, entitled "STORAGE PHOSPHOR CASSETTE", and filed on
common date herewith in the names of Wendlandt et al., and which is assigned to
the assignee of this application.

15

FIELD OF THE INVENTION

The present invention relates generally to cassettes for
photographic elements, and more particularly, to an x-ray cassette used in
computed radiography.

20

BACKGROUND OF THE INVENTION

In the field of computed radiography, a photographic element has
an image formed thereon by x-rays. The photographic element is subsequently
provided to a reader wherein the element is stimulated to emit a radiation pattern
25 that is indicative of the image formed by the x-rays. Typically, storage phosphors
are used to capture radiographic images from incident x-rays. Most radiographic
procedures are carried out within normal room lighting conditions, accordingly, a
primary requirement for any computed radiography x-ray cassette is to shield the
storage phosphor from exposure by ambient light.

Cassettes of the kind used in computed radiography may comprise a container having an upper and lower parts that are hinged together so that they can be opened for insertion of a flexible film sheet or a rigid film plate comprising the photographic element. The cassette is closed and latched so that
5 the cassette with the element therein can be used with an x-ray apparatus to produce an image on the photographic element. Then, the cassette is taken to a reader where the cassette is opened and the photographic element extracted by suitable feeders, such as a suction feeding device. The photographic element separates from the cassette, and is transported through the reader where it is
10 stimulated to emit a radiation pattern which is captured for storage and use. The radiation pattern is subsequently erased from the photographic element before being returned to the cassette for re-use.

U.S. Patents No. 5,861,631 (Wendlandt et al.),
5,869,839 (Wendlandt et al.), and 5,943,390 (Wendlandt et al.), commonly
15 assigned and incorporated herein by reference, disclose cassettes of the kind used in computed radiography.

While such cassettes may have achieved certain degrees of success in their particular applications, cassettes are susceptible to various types of damage when dropped or roughly handled. Accordingly, it is desirable to
20 increase the durability of the cassette while minimizing cost and weight, and preserving the same basic nature of design.

Accordingly, a need continues to exist for a cassette which is durable and reduces its susceptibility to damage when dropped or roughly handled, and the same basic nature of design is preserved.

25

SUMMARY OF THE INVENTION

An object of the present invention is to provide a cassette which has increased durability, and is resistant to damage when dropped or roughly handled.

This object is given only by way of illustrative example. Thus, other desirable objectives and advantages inherently achieved by the disclosed invention may occur or become apparent to those skilled in the art. The invention is defined by the appended claims.

5 According to one aspect of the invention, there is provided a x-ray cassette comprising a shell and a storage phosphor assembly. The shell comprises an upper and lower panel, a first and second side member, and a front end member. The first and second side members and front end member join the upper and lower panels to define a cavity having an open end. The storage phosphor
10 assembly comprises a back end member, an insert plate, and an edge insert. The storage phosphor assembly is adapted to be removably contained within the shell such that the back end member closes off the open end of the shell. A first side of the edge insert is affixed to the insert plate. A first end of the edge insert is disposed adjacent the back end member, and a second end of the edge insert
15 comprises at least one recess on the first side. In a preferred embodiment, the second end of the edge insert comprises a plurality of spaced recesses. In a preferred embodiment, the insert plate includes a honeycomb core comprising honeycomb cells wherein the honeycomb cells disposed along a perimeter of the honeycomb core are filled with an adhesive or epoxy.

20 The present invention provides a cassette which has increased durability and reduced susceptibility to damage when dropped or roughly handled.

BRIEF DESCRIPTION OF THE DRAWINGS

25 The foregoing and other objects, features, and advantages of the invention will be apparent from the following more particular description of the preferred embodiments of the invention, as illustrated in the accompanying drawings.

FIG. 1 shows a perspective view of a storage phosphor cassette in accordance with the present invention.

30 FIG. 2 shows a bottom view of the cassette of FIG. 1.

FIG. 3 shows a top view of the storage phosphor assembly of the cassette of FIG. 1.

FIG. 4 shows a side view of the storage phosphor assembly of FIG. 3.

5 FIG. 5 shows a bottom view of a corner of the cassette of FIG. 2.

FIG. 6 shows a perspective view of a corner of the cassette of FIG. 2.

FIG. 7 shows a cross sectional view of the insert plate of the storage phosphor assembly of FIG. 3 taken along the plane of the insert plate.

10 FIG. 8 shows a top view of a corner of the insert plate of the storage phosphor assembly of FIG. 3.

FIG. 9 shows a top view of another corner of the insert plate of the storage phosphor assembly of FIG. 3.

15 FIG. 10. shows a cross sectional view of insert plate of the storage phosphor assembly of FIG. 3 taken transverse to the plane of the insert plate.

FIG. 11 shows a perspective view of a corner of the of insert plate of the storage phosphor assembly.

FIG. 12 shows a perspective view of another corner of the insert plate of the storage phosphor assembly.

20 FIG. 13 shows a perspective view of the back end member of the storage phosphor assembly.

FIG. 14 shows an edge insert of the storage phosphor assembly in accordance with the present invention.

25 FIG. 15 shows a storage phosphor assembly incorporating the edge insert of FIG. 14.

FIG. 16 shows an edge insert illustrating various recess configurations.

DETAILED DESCRIPTION OF THE INVENTION

The following is a detailed description of the preferred embodiments of the invention, reference being made to the drawings in which the same reference numerals identify the same elements of structure in each of the
5 several figures.

Figures 1-4 show a storage phosphor cassette 10 in accordance with the present invention. Cassette 10 includes a shell 12 comprising an upper panel 14, a lower panel 16, a first side member 18, a second side member 20, and a front end member 22. Upper and lower panels 14,16 are preferably rectangular
10 in shape. First side member 18, second side member 20, and front end member 22 join upper and lower panels 14,16 to form a five-sided cavity having an open end 24.

Cassette 10 further includes a storage phosphor assembly 26 having a front edge 27, a back end member 28, an insert plate 30 having an upper
15 face and being cantilevered from back end member 28, and a storage phosphor 32 disposed on the upper face of insert plate 30. A front edge of insert plate 30 includes corners 68,70, which are preferably rounded. Back end member 28 includes apertures 29,31 for access to the interior of back end member 28 to latch and unlatch a latch bar 50 slidably mounted therein.

20 Storage phosphor assembly 26 is removably contained within the cavity of shell 12 such that back end member 28 of storage phosphor assembly 26 closes off open end 24 of shell 12, thereby providing a light-tight enclosure for storage phosphor 32.

Back end member 28 of storage phosphor assembly 26 includes
25 end portions 64,66. First and second side members 18,20 include a corner structure 60,62, respectively, which respectively engage end portions 64,66. Corner structures 60,62 can be integral with first and second side members 18,20, or as illustrated, can be separate corner pieces which are secured to first and second side members 18,20. End portions 64,66 and respective corner structures
30 60,62 have complimentary, interlocking configurations, such that, should cassette

10 be dropped and a force exerted on either corner structure 60,62, the force is transferred to storage phosphor assembly 26, forcing assembly 26 into shell 12. Corner structure 62 engaged with end portion 66 is further illustrated in Figures 5-6.

5 Referring now to Figures 7-10, to minimize damage to insert plate 30 should cassette 10 be dropped, insert plate 30 is comprised of a lightweight rigid structure including an aluminum honeycomb core 71 and outer aluminum skins 72,74. The edge of honeycomb core 71 is milled out (recessed) around the entire perimeter to create a cavity. As best illustrated in Figure 7, edge inserts 10 76,78,80 are each glued into a side of the cavity formed in the honeycomb structure. Back end member 28 is inserted to a fourth side of the cavity formed in the honeycomb structure. One end of edge insert 76 interlocks with back end member 28 by means of a connector 90 which can be, for example, a key or leg. Similarly, one end of edge insert 80 interlocks with back end member 28 by 15 means of a connector 92 which can be, for example, key or leg. As illustrated in Figure 7, connectors 90,92 are each shown as a leg of back end member 28 extending into edge inserts 76,80 in a direction parallel to the length of back end member 28, which is transverse to the length of edge inserts 76,80, respectively. The interlocking arrangement of edge inserts 76,80 with back end member 28 20 transfers a force from a side impact to cassette 10 to back end member 28 rather than buckling outer aluminum skins 72,74.

Referring now to Figures 11-12, edge inserts 76,80 may optionally comprise a plurality of shallow slots or channels 93 disposed on at least one of its surfaces. Such channels 93 promote adhesion of the edge inserts with insert plate 25 30 since they provide additional surface area for the glue to migrate and adhere rather than being directed to the cells of the honeycomb. As illustrated, channels 93 form an angled relative to an edge of edge inserts 76, 80. A cross-hatch pattern might also be employed.

As illustrated in Figures 11-13, back end member 28 may also optionally comprise channels 93, with channels 93 being angled relative to an edge of back end member 28.

Preferably, edge inserts 76,80 extend slightly beyond the perimeter of outer aluminum skins 72,74 (as shown in Figure 3 at 94,96, respectively) thereby creating a shock absorption system to absorb and distribute forces on insert plate 30. If edge inserts 76,80 extend beyond the perimeter of outer aluminum skins 72,74, then preferably channels 93 are disposed on that portion of edge inserts 76,80 which do not extend beyond the perimeter, but rather, are disposed on that portion of edge inserts 76,80 internal to honeycomb core 71.

Preferably, edge inserts 76,80 are of aluminum, edge insert 78 is of a polymeric material, and back end member 28 is of an aluminum material.

Referring now to Figures 14 and 15, one side of edge inserts 76,80, (the side to be inserted into insert plate 30, i.e., the side glued into the side of the cavity formed in honeycomb core 71) may comprise a non-planar configuration. That is, a side of edge inserts 76,80 may include at least one groove or recess 100. Recess 100 is disposed at the end of edge inserts 76,80 adjacent edge insert 78. Accordingly, when edge insert 76 or 80 is inserted into insert plate 30, recess 100 promotes adhesion of the edge inserts with insert plate 30 since recess 100 provides additional surface area for the glue to migrate and adhere.

Further, any exposed (i.e, partially or fully open) cells of honeycomb core 71 disposed along the perimeter of honeycomb core 71 are preferably filled with an adhesive or epoxy material which also fills recesses 100 of edge inserts 76,80. The addition of the hardened adhesive or epoxy provides increased stiffness to the edge of honeycomb core 71. A filler material other than adhesives and epoxys might be employed to fill the cavities of the cells to provide compressive support structure, for example, liquid materials which harden when cured, adhesives, sealants, surface fillers, potting or encapsulating compounds, and expanding foams. Examples of adhesives include epoxy adhesives, methacrylate adhesives, urethane adhesives, and hot melt adhesives. Examples of

sealants include silicone sealant, urethane sealant, polysulfide sealant, and acrylic caulk. Examples of surface fillers and potting compounds include polyester resin with talc powder, epoxy resin with silica, polymeric putties and resin systems. Examples of expanding foams include two-part liquid expanding urethane foam.

- 5 If any of these materials include adhesive characteristics, the materials will promote adhesion between the edge inserts with the insert plate in addition to providing structural support.

The stiffness of the edge of honeycomb core 71 is further enhanced since the linear path for bending/buckling has been reduced/eliminated. That is,
10 there is no longer a linear path for bending or buckling to occur between edge inserts 76,80 and honeycomb core 71, in the event of an impact force or rough handling to cassette 10. Should cassette 10 experience an impact force, the impact force would be directed along the non-linear path where the adhesive (filler material) interfaces to either honeycomb core 71 or recesses 100 in edge
15 inserts 76,80, and since there is no linear path, the likelihood of bending or buckling is reduced/eliminated. Stated alternatively, should cassette 10 experience an impact force, the additional material filling honeycomb core 71 in conjunction with the non-linear interfaces of the adhesive/epoxy to both honeycomb core 71 and recesses 100 in edge inserts 76,80, reduce/eliminate the likelihood of bending
20 or buckling in that location since the linear interface has been removed, the linear interface being the area likely to fail (i.e., prone to failure).

A plurality of recesses 100 may be employed in each edge insert 76,80 as illustrated in Figures 14 and 15 wherein five recess 100 are employed with an interstice 102 therebetween.

- 25 Applicants have noted that five or six recesses 100 may be suitable for the present application with each recess 100 comprising a semi-circular shape having a radius of 0.5 inches and interstice 102 of 0.080 inches. However, those skilled in the art will recognize that other shapes for recess 100 may be suitable. For example, as illustrated in Figure 16, recess 100 may comprise a wave, oval,
30 skewed curve, or a linear shape such as a triangle. Fewer or more recesses 100

may be employed than that illustrated in Figures 14 and 15. Similarly, interstice 102 may be greater or smaller than that illustrated.

The invention has been described in detail with particular reference to a presently preferred embodiment, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention. The
5 presently disclosed embodiments are therefore considered in all respects to be illustrative and not restrictive. The scope of the invention is indicated by the appended claims, and all changes that come within the meaning and range of equivalents thereof are intended to be embraced therein.

10

11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000

PARTS LIST

10	cassette
12	shell
14	upper panel
16	lower panel
18	first side member
20	second side member
22	front end member
24	open end
26	storage phosphor assembly
27	front edge
28	back end member
29,31	apertures
30	insert plate
32	storage phosphor
50	latch bar
60,62	corner structures
64,66	end portions
68,70	front corners
71	honeycomb core
72,74	outer aluminum skins
76,78,80	edge inserts
90	connector
92	connector
93	channels; slots
94,96	extensions
100	groove; recess
102	interstice